



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,611	06/03/2005	Masaru Kuramoto	Q88048	4984
23373	7590	02/04/2010	EXAMINER	
SUGHRUE MION, PLLC			KIM, JAY C	
2100 PENNSYLVANIA AVENUE, N.W.				
SUITE 800			ART UNIT	PAPER NUMBER
WASHINGTON, DC 20037			2815	
			NOTIFICATION DATE	DELIVERY MODE
			02/04/2010	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

sughrue@sughrue.com  
PPROCESSING@SUGHRUE.COM  
USPTO@SUGHRUE.COM

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/537,611	KURAMOTO ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	JAY C. KIM	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 18 December 2009.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-4,6-9,11 and 22-25 is/are pending in the application.  
 4a) Of the above claim(s) 23 and 25 is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-4,6-9,11,22 and 24 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 03 June 2005 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____.   | 6) <input type="checkbox"/> Other: _____ .                        |

## **DETAILED ACTION**

This Office Action is in response to Election filed December 18, 2009.

### ***Election/Restrictions***

1. Applicants' election without traverse of Species IV in the reply filed on December 18, 2009 is acknowledged. Claims 23 and 25 are withdrawn from further consideration as being drawn to a nonelected Species.

### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Objections***

3. Claims 1, 6, 22 and 24 are objected to because of the following informalities: on line 8 of claims 1 and 22, and on line 9 of claims 6 and 24, "group III nitride" should be inserted before "semiconductor multilayer film". Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 22 and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to

one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Regarding claims 22 and 24, Applicants did not originally disclose a specific range of a dislocation density of the group III nitride semiconductor multilayer film directly on the mask.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 22 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claims 22 and 24, it is not clear how the group III nitride semiconductor multilayer film may have a dislocation density *directly on* the mask of  $1 \times 10^7/\text{cm}^2$  or less when the mask has a polycrystalline material deposited on a surface thereof, which suggests that the polycrystalline material is formed on the mask, as shown in Fig. 4 of current Application. In other words, do Applicants claim that the group III nitride semiconductor multilayer film has a dislocation density *directly on* a side surface of the mask of  $1 \times 10^7/\text{cm}^2$  or less or do Applicants claim that the group III nitride semiconductor multilayer film has a dislocation density *directly on* the polycrystalline material of  $1 \times 10^7/\text{cm}^2$  or less?

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-4, 6-9, 11, 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US 2003/0067953) in view of Motoki et al. (US 2003/0145783).

Regarding claim 1, Kim et al. disclose a nitride semiconductor substrate (portion of Fig. 3) comprising a group III nitride semiconductor substrate (100) (line 7 of [0033]), a mask (114) (line 3 of [0033]) formed over the group III nitride semiconductor substrate (100), and a group III nitride semiconductor multilayer film (composite layer of 102-112) formed above the mask (114), wherein the mask (114) has a polycrystalline material (116) (AlGaN, lines 5-7 of [0034]) deposited on a surface thereof, wherein a part of the mask (114) is not covered with the group III nitride semiconductor multilayer film (composite layer of 102-112).

Kim et al. differ from the claimed invention by not showing that the group III nitride semiconductor substrate has a dislocation density in a vicinity of a surface thereof of  $1 \times 10^7/\text{cm}^2$  or less.

Motoki et al. disclose a group III nitride semiconductor substrate (Fig. 10(5)) having a dislocation density in a vicinity of a surface thereof of less than  $1 \times 10^7/\text{cm}^2$  (lines 7-8 of [0316]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. may have a low dislocation density as disclosed by Motoki et al., because the

combined nitride semiconductor substrate could be used for improving device characteristics due to low dislocation density of the substrate. Further, the claim is *prima facie* obvious without showing that the claimed range of a dislocation density achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 2 and 4, Kim et al. further disclose that the polycrystalline material (AlGaN) is formed from a material containing aluminum and nitrogen as essential elements (claim 2), and the mask (114) is provided on the surface of the group III nitride semiconductor substrate (100) (claim 4).

Regarding claim 3, Kim et al. in view of Motoki et al. differ from the claimed invention by not showing that voids are formed on the surface of the mask having the polycrystalline material.

Motoki et al. further disclose that voids (voluminous defects in voluminous defect accumulating region H in Fig. 5(a)(3)) are formed on a surface of a mask (23) having a

Art Unit: 2815

polycrystalline material ([0183], lines 7-9 of [0299], lines 1-3 of [0420], and lines 11-13 of [0427]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. in view of Motoki et al. may comprise voids formed on the surface of the mask having the polycrystalline material as disclosed by Motoki et al., because voids would be formed on a mask while growing a single crystal nitride semiconductor layer due to imperfect growth of a single crystal nitride semiconductor layer on an amorphous or polycrystalline material.

Regarding claim 6, Kim et al. disclose a nitride semiconductor device (Fig. 3) comprising a group III nitride semiconductor substrate (100) (line 7 of [0033]), a mask (114) (line 3 of [0033]) formed over the group III nitride semiconductor substrate (100), and a group III nitride semiconductor multilayer film (composite layer of 102-112) formed above the mask (114), the group III nitride semiconductor multilayer film including an active layer (108) (line 25 of [0033]), wherein the mask (114) has a polycrystalline material (116) (AlGaN, lines 5-7 of [0034]) deposited on a surface thereof, wherein a part of the mask (114) is not covered with the group III nitride semiconductor multilayer film (composite layer of 102-112).

Kim et al. differ from the claimed invention by not showing that the group III nitride semiconductor substrate has a dislocation density in a vicinity of a surface thereof of  $1 \times 10^7/\text{cm}^2$  or less.

Motoki et al. disclose a group III nitride semiconductor substrate (Fig. 10(5)) having a dislocation density in a vicinity of a surface thereof of less than  $1 \times 10^7/\text{cm}^2$  (lines 7-8 of [0316]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. may have a low dislocation density as disclosed by Motoki et al., because the combined nitride semiconductor substrate could be used for improving device characteristics due to low dislocation density of the substrate. Further, the claim is *prima facie* obvious without showing that the claimed range of a dislocation density achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 7, 9 and 11, Kim et al. further disclose that the polycrystalline material (AlGaN) is formed from a material containing aluminum and nitrogen as essential elements (claim 7), the mask (114) is provided on the surface of the group III

nitride semiconductor substrate (100) (claim 9), and the mask (114) is provided in a vicinity of a device separating groove (either groove on both sides) of the nitride semiconductor device (Fig. 3) (claim 11).

Regarding claim 8, Kim et al. in view of Motoki et al. differ from the claimed invention by not showing that voids are formed on the surface of the mask having the polycrystalline material.

Motoki et al. further disclose that voids (voluminous defects in voluminous defect accumulating region H in Fig. 5(a)(3)) are formed on a surface of a mask (23) having a polycrystalline material ([0183], lines 7-9 of [0299], lines 1-3 of [0420], and lines 11-13 of [0427]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. in view of Motoki et al. may comprise voids formed on the surface of the mask having the polycrystalline material as disclosed by Motoki et al., because voids would be formed on a mask while growing a single crystal nitride semiconductor layer due to imperfect growth of a single crystal nitride semiconductor layer on an amorphous or polycrystalline material.

Regarding claim 22, Kim et al. disclose a nitride semiconductor substrate (portion of Fig. 3) comprising a group III nitride semiconductor substrate (100) (line 7 of [0033]), a mask (114) (line 3 of [0033]) formed over the group III nitride semiconductor substrate (100), and a group III nitride semiconductor multilayer film (composite layer of 102-112)

formed above the mask (114), wherein the mask (114) has a polycrystalline material (116) (AlGaN, lines 5-7 of [0034]) deposited on a surface thereof.

Kim et al. differ from the claimed invention by not showing that the group III nitride semiconductor substrate has a dislocation density in a vicinity of a surface thereof of  $1 \times 10^7/\text{cm}^2$  or less, and the group III nitride semiconductor multilayer film has a dislocation density directly on the mask of  $1 \times 10^7/\text{cm}^2$  or less.

Motoki et al. disclose a group III nitride semiconductor substrate (Fig. 10(5)) having a dislocation density in a vicinity of a surface thereof of less than  $1 \times 10^7/\text{cm}^2$  (lines 7-8 of [0316]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. may have a low dislocation density as disclosed by Motoki et al., because the combined nitride semiconductor substrate could be used for improving device characteristics due to low dislocation density of the substrate. Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor multilayer film may have a dislocation density on the mask of  $1 \times 10^7/\text{cm}^2$  or less, because a reduced dislocation density would improve performance of the semiconductor light emitting device. Still further, the claim is *prima facie* obvious without showing that the claimed range of a dislocation density achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)

(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claim 24, Kim et al. disclose a nitride semiconductor device (Fig. 3) comprising a group III nitride semiconductor substrate (100) (line 7 of [0033]), a mask (114) (line 3 of [0033]) formed over the group III nitride semiconductor substrate (100), and a group III nitride semiconductor multilayer film (composite layer of 102-112) formed above the mask (114), the group III nitride semiconductor multilayer film including an active layer (108) (line 25 of [0033]), wherein the mask (114) has a polycrystalline material (116) (AlGaN, lines 5-7 of [0034]) deposited on a surface thereof.

Kim et al. differ from the claimed invention by not showing that the group III nitride semiconductor substrate has a dislocation density in a vicinity of a surface thereof of  $1 \times 10^7/\text{cm}^2$  or less, and the group III nitride semiconductor multilayer film has a dislocation density directly on the mask of  $1 \times 10^7/\text{cm}^2$  or less.

Motoki et al. disclose a group III nitride semiconductor substrate (Fig. 10(5)) having a dislocation density in a vicinity of a surface thereof of less than  $1 \times 10^7/\text{cm}^2$  (lines 7-8 of [0316]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. may have a low dislocation density as disclosed by Motoki et al., because the combined nitride semiconductor substrate could be used for improving device characteristics due to low dislocation density of the substrate. Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor multilayer film may have a dislocation density on the mask of  $1 \times 10^7/\text{cm}^2$  or less, because a reduced dislocation density would improve performance of the semiconductor light emitting device. Still further, the claim is *prima facie* obvious without showing that the claimed range of a dislocation density achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

### ***Response to Arguments***

10. Applicants' arguments with respect to claims 1 and 6 have been considered but are moot in view of the new ground of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAY C. KIM whose telephone number is (571) 270-1620. The examiner can normally be reached on 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. K./  
Examiner, Art Unit 2815  
January 28, 2010  
/Kenneth A Parker/  
Supervisory Patent Examiner, Art Unit 2815